

Cloud Computing Assignment

Set up an Azure Storage account and upload the student.csv

The screenshot shows the Microsoft Azure portal interface. At the top, there's a navigation bar with a search bar and a Copilot button. The main area is titled "mysorena_1726876898941 | Overview". A prominent message says "... Deployment is in progress... Deployment to resource group 'Assignment-1' is in progress." Below this, there's a "Deployment details" section with a table showing one item: "Deployment name: mysorena_1726876898941", "Subscription: Azure for Students", and "Resource group: Assignment-1". The table has columns for "Resource", "Type", "Status", and "Operation details". A note below the table says "No results." There are also sections for "Give feedback" and "Tell us about your experience with deployment". To the right, there are promotional cards for "Microsoft Defender for Cloud" and "Free Microsoft tutorials". At the bottom, there's a taskbar with various icons.

The screenshot shows the Microsoft Azure portal interface. At the top, there's a navigation bar with a search bar and a Copilot button. The main area is titled "mysorena | Containers". The left sidebar shows a tree view with "Storage account" selected, followed by "Containers", "Access Control (IAM)", "Data storage", "Security + networking", "Settings", "Configuration", "Resource sharing (CORS)", "Advisor recommendations", "Endpoints", "Automation", "Export template", and "Help". The "Containers" blade displays a table of containers. The table has columns for "Name", "Last modified", "Anonymous access level", and "Lease state". It lists two containers: "Logs" (modified 9/20/2024, 8:02:12 PM, Private, Available) and "mysorena" (modified 9/20/2024, 8:05:09 PM, Private, Available). A "Search containers by prefix" input field and a "Show deleted containers" button are also present. At the bottom, there's a taskbar with various icons.

Microsoft Azure

mysorena Container

Search resources, services, and docs (G+)

Copilot

All Bookmarks

mysorena@mail.uc.edu UNIVERSITY OF CINCINNATI MAIL

Home >

Overview

Diagnose and solve problems

Access Control (IAM)

Settings

Upload Change access level Refresh Delete Change tier Acquire lease Break lease View snapshots Create snapshot Give feedback

Authentication method: Access key (Switch to Microsoft Entra user account)

Location: mysorena

Search blobs by prefix (case-sensitive)

Show deleted blobs

Add filter

| Name | Modified | Access tier | Archive status | Blob type | Size | Lease state |
|-------------------------|-----------------------|----------------|----------------|------------|----------|-------------|
| student-dataset (4).csv | 9/20/2024, 8:06:07 PM | Hot (Inferred) | | Block blob | 26.79 KB | Available |



Set up an Azure SQL Database and create the Students table

The screenshot shows the Microsoft Azure portal with a deployment overview. The deployment name is "Microsoft.SQLDatabase.newDatabaseNewServer_6c9e19b7805f4579a9ab9". It is marked as "Deployment succeeded". Deployment details include a Subscription ("Azure for Students"), Start time ("9/20/2024, 8:12:01 PM"), and Resource group ("Assignment-1"). A Correlation ID is also listed. There are sections for "Deployment details" and "Next steps", with a prominent "Go to resource" button. On the right side, there are promotional cards for "Cost management", "Microsoft Defender for Cloud", "Free Microsoft tutorials", and "Work with an expert". The status bar at the bottom indicates the date and time as "20-09-2024 20:14".

The screenshot shows the "Networking" settings for the Azure SQL database. It includes sections for "Virtual networks" and "Firewall rules". Under "Virtual networks", there is a note about allowing connections from IP addresses in the firewall rules. Under "Firewall rules", there is a note about saving public network access before adding new virtual networks. A table lists firewall rules with columns for Rule, Virtual network, Subnet, Address range, Endpoint status, Resource group, Subscription, and State. One rule is shown with a start IPv4 address of "192.168.4.22" and an end IPv4 address of "192.168.4.22". There is also an "Exceptions" section with a checkbox for "Allow Azure services and resources to access this server". At the bottom are "Save" and "Discard" buttons. The status bar at the bottom indicates the date and time as "20-09-2024 20:16".

```

CREATE TABLE Students (
    StudentID INT PRIMARY KEY,
    Name NVARCHAR(100),
    Country NVARCHAR(100),
);

```

Messages

Started executing query at Line 1
Commands completed successfully.
Total execution time: 00:00:00.067

Deployment succeeded
Deployment 'Microsoft.DataFactory-20240920202204' to resource group 'Assignment-1' was successful.

Cost management
Get notified to stay within your budget and prevent unexpected charges on your bill.
Set up cost alerts >

Microsoft Defender for Cloud
Secure your apps and infrastructure
Go to Microsoft Defender for Cloud >

Free Microsoft tutorials
Start learning today >

Work with an expert
Azure experts are service provider partners who can help manage your assets on Azure and be your first line of support.
Find an Azure expert >

The screenshot shows the Microsoft Azure Data Factory interface. The left sidebar has 'Data Factory' selected under 'Connections'. The main area is titled 'Linked services' with a sub-instruction: 'Linked service defines the connection information to a data store or compute. Learn more'. A 'New' button is visible. On the right, a form is open for creating a new linked service:

- Name**: BlobStorageLinkedService
- Description**: (empty)
- Connect via integration runtime**: AutoResolveIntegrationRuntime
- Authentication type**: Account key
- Connection string**: Azure Key Vault
- Account selection method**: From Azure subscription (selected)
- Azure subscription**: Select all
- Storage account name**: (empty)
- Additional connection properties**: (empty)

At the bottom right of the form are 'Create', 'Back', 'Test connection', and 'Cancel' buttons.

The screenshot shows the same Microsoft Azure Data Factory interface as the previous one, but with a success message displayed in a toast notification:

Successfully created
Successfully created BlobStorageLinkedService (Linked service).

The 'Linked services' table now shows one item:

| Name | Type | Related | Annotations |
|--------------------------|--------------------|---------|-------------|
| BlobStorageLinkedService | Azure Blob Storage | 0 | |

PROJECT 1: Build an End-to-end... | mysorena - Microsoft Azure | mysorena - Azure Data Factory | +

adf.azure.com/en/management/datalinkedservices?factory=%2Fsubscriptions%2F4db1e8da-a1cb-4181-91d2-751a24d8abc4%2FresourceGroups%2FAssignment-1%2Fproviders%2F...

Microsoft Azure | Data Factory > mysorena | Search factory and documentation

Thinking of migrating to Fabric? Already made the switch? We want to hear from you! Spend just 20 minutes on our [Fabric migration survey](#) to shape the future of Data Factory, Synapse, and Spark in Fabric.

Successfully created

Successfully created AzureSQLLinkedService (Linked service).

Linked services

General

Connections

Linked services

Integration runtimes

Microsoft Purview

Source control

Git configuration

ARM template

Author

Triggers

Global parameters

Data flow libraries

Security

Credentials

Customer managed key

Widgets

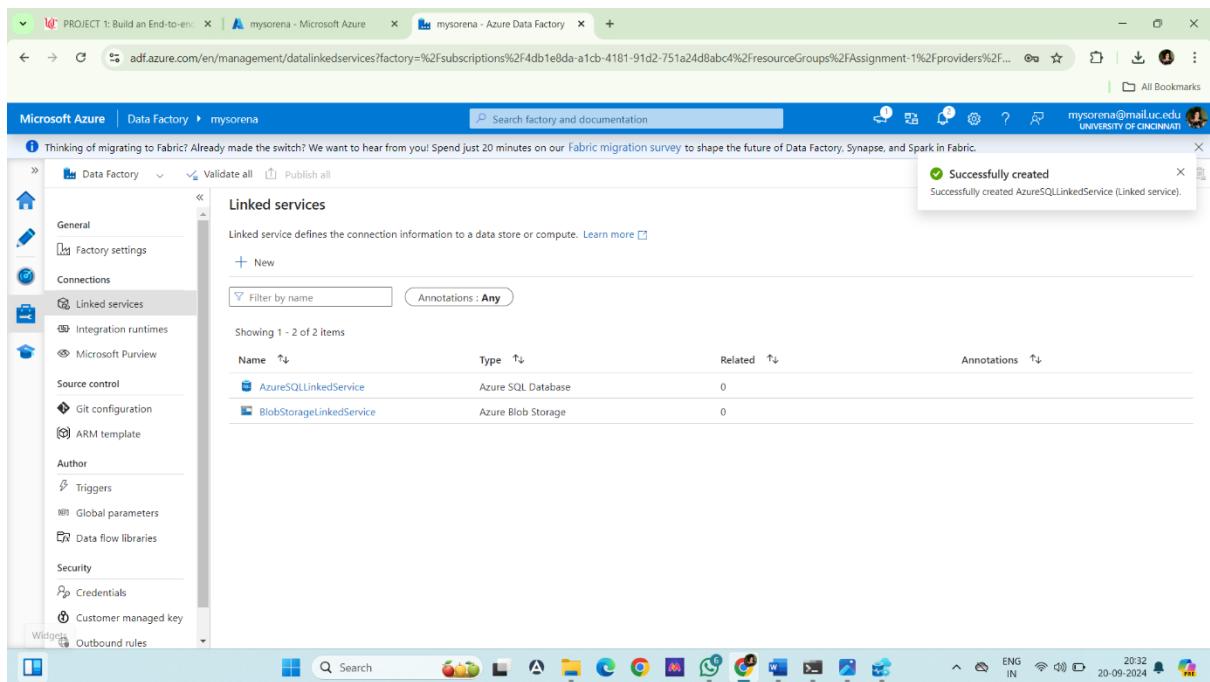
New

Filter by name Annotations : Any

Showing 1 - 2 of 2 items

| Name | Type | Related | Annotations |
|--------------------------|--------------------|---------|-------------|
| AzureSQLLinkedService | Azure SQL Database | 0 | |
| BlobStorageLinkedService | Azure Blob Storage | 0 | |

Search 20:32 20-09-2024 ENG IN



PROJECT 1: Build an End-to-end... | mysorena - Microsoft Azure | mysorena - Azure Data Factory | +

adf.azure.com/en/authoring/pipeline/pipeline1?factory=%2Fsubscriptions%2F4db1e8da-a1cb-4181-91d2-751a24d8abc4%2FresourceGroups%2FAssignment-1%2Fproviders%2F...

Microsoft Azure | Data Factory > mysorena | Search factory and documentation

Thinking of migrating to Fabric? Already made the switch? We want to hear from you! Spend just 20 minutes on our [Fabric migration survey](#) to shape the future of Data Factory, Synapse, and Spark in Fabric.

Preview experience Off

Factory Resources

Pipelines

mysorena

Change Data Capture (preview)

Datasets

SQLStudentTable

StudentCSV

Data flows

Power Query

Activities

Copy data1

Validate

Validate copy runtime

Debug

Add trigger

Properties

General

Related

Name * mysorena

Description

Annotations

+ New

General Source Sink Mapping Settings User properties

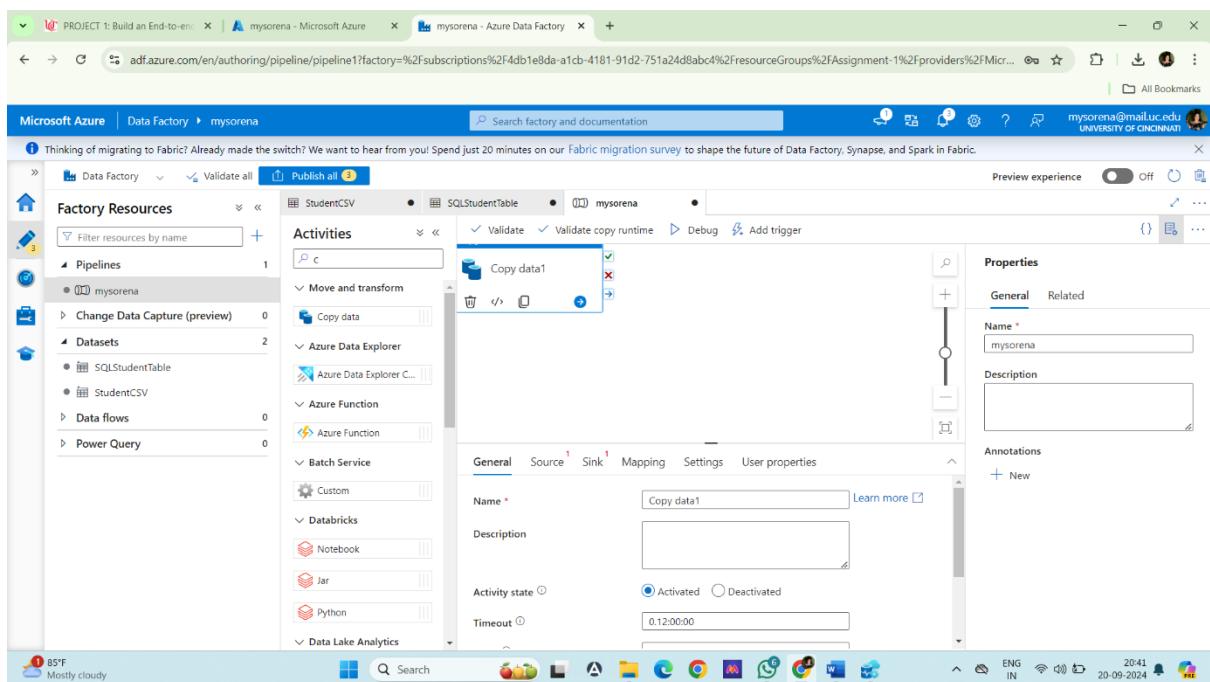
Name * Copy data1

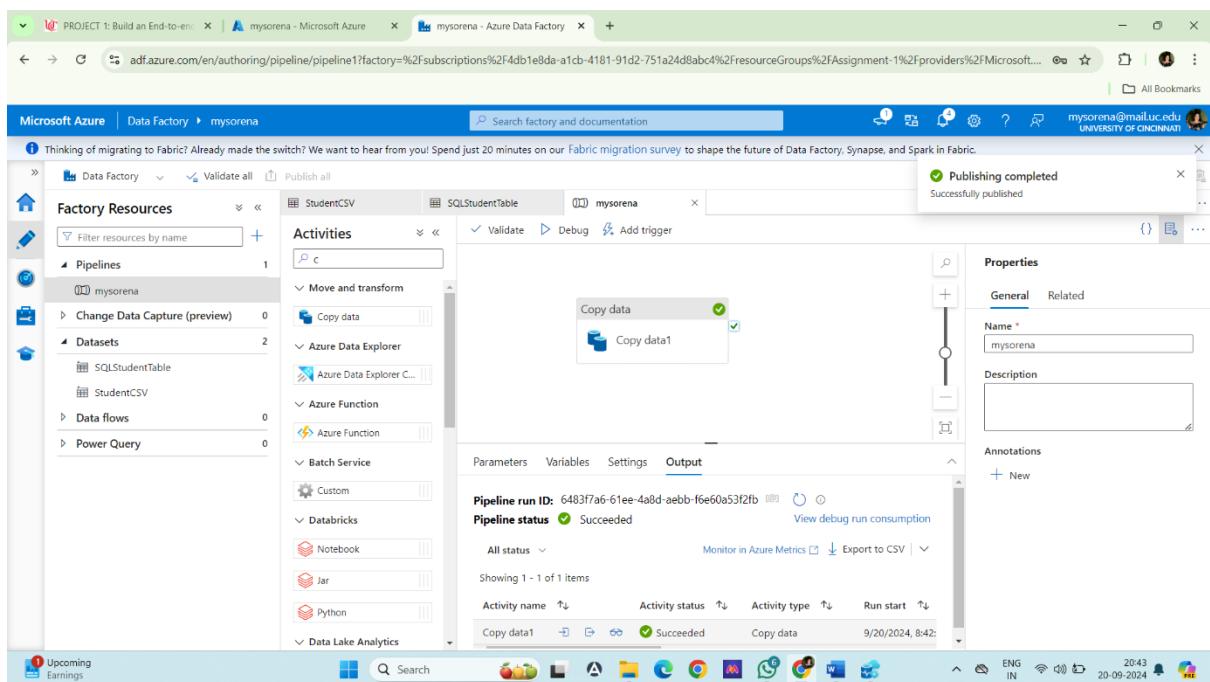
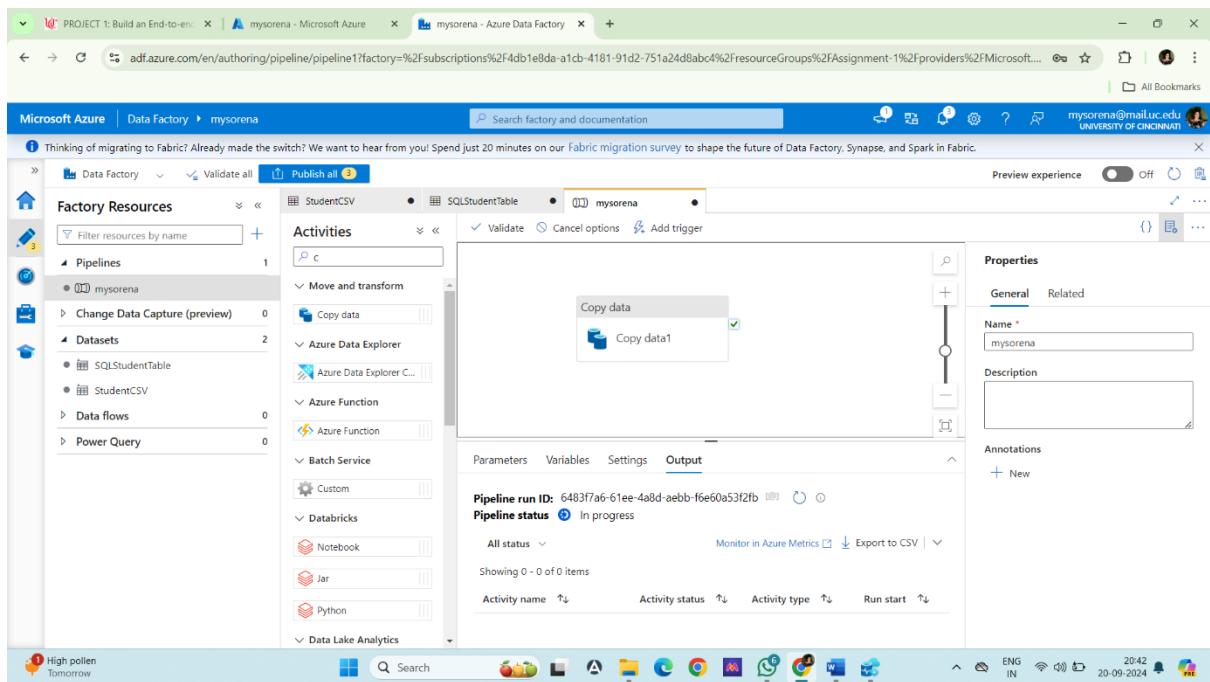
Description

Activity state Activated

Timeout 0:12:00:00

85°F Mostly cloudy 20:41 20-09-2024 ENG IN





File Edit View Help

CONNECTIONS id-1 SQLQuery_2 - disconnected Results.csv mysorena.database.windows.net:mysorena SQLQuery_3 - (88) m...sorena SQLQuery_4 - (52) m...sorena

Run Cancel Disconnect Change Database: mysorena Estimated Plan Enable Actual Plan Parse Enable SQLCMD To Notebook

1 SELECT Country, COUNT(*) AS StudentCount
2 FROM Students
3 GROUP BY Country;
4

Results Messages

| | Country | StudentCount |
|----|---------------------|--------------|
| 1 | Bangladesh | 1 |
| 2 | Brazil | 9 |
| 3 | Canada | 7 |
| 4 | Chile | 1 |
| 5 | China | 13 |
| 6 | Colombia | 5 |
| 7 | Cuba | 1 |
| 8 | Dominican Republic | 1 |
| 9 | Egypt | 1 |
| 10 | El Salvador | 1 |
| 11 | Germany | 1 |
| 12 | India | 8 |
| 13 | Japan | 13 |
| 14 | Korea (Republic of) | 3 |
| 15 | Mexico | 24 |
| 16 | Morocco | 1 |
| 17 | Myanmar | 1 |

AZURE 3 0 85°F Mostly cloudy 20-09-2024

File Edit View Help

CONNECTIONS id-1 SQLQuery_2 - disconnected Results.csv mysorena.database.windows.net:mysorena SQLQuery_3 - (88) m...sorena SQLQuery_4 - (52) m...sorena

Run Cancel Disconnect Change Database: mysorena Estimated Plan Enable Actual Plan Parse Enable SQLCMD To Notebook

1 SELECT Country, COUNT(*) AS StudentCount
2 FROM Students
3 GROUP BY Country;
4

Results Messages

| | Country | StudentCount |
|----|-----------------------|--------------|
| 15 | Mexico | 24 |
| 16 | Morocco | 1 |
| 17 | Myanmar | 1 |
| 18 | Netherlands | 1 |
| 19 | Nicaragua | 1 |
| 20 | Pakistan | 3 |
| 21 | Peru | 1 |
| 22 | Philippines | 1 |
| 23 | Poland | 1 |
| 24 | Russian Federation | 6 |
| 25 | Spain | 2 |
| 26 | Thailand | 1 |
| 27 | Tunisia | 1 |
| 28 | Turkey | 2 |
| 29 | Ukraine | 1 |
| 30 | United Kingdom | 2 |
| 31 | United States of A... | 193 |

AZURE 3 0 85°F Mostly cloudy 20-09-2024

- **Authentication:** SQL Server Authentication
- **Server name:** (**mysorena**)-server.**database.windows.net**
- Database name: (**mysorena**)-db
- **Login:** SQL Server username (mysorena)
- **Password:** nmg_Blueberry
- Ensure the firewall settings and credentials are correct

Total Estimated Monthly Cost for Azure Student Subscription:

- Azure Storage Account: \$0.018
- Azure SQL Database (Basic Tier): \$4.99
- Azure Data Factory (Pipeline Activity Runs): \$4
- Estimated Total Cost: Around \$9 per month.

Project Overview

Objective: The main goal of this project was to create a complete data pipeline using Azure cloud services. We needed to pull data from a CSV file with student information, process it, and load it into an Azure SQL Database for analysis.

Tools Used:

- **Azure Subscription:** The foundation for hosting our cloud services.
- **Azure Storage Account:** Used to upload and store the student dataset CSV file.
- **Azure SQL Database:** A relational database for storing and querying the processed student data.
- **Azure Data Factory:** The primary tool for building the data pipeline to move data from Azure Storage into the SQL Database.
- **Azure Data Studio:** Used to query the database after uploading the data.

Implementation Steps:

1. **Setting Up Azure Storage Account:**
 - Created a storage account and a Blob Storage container.
 - Uploaded the student-dataset.csv file into Blob Storage.
2. **Setting Up Azure SQL Database:**
 - Set up the Azure SQL Database and adjusted the firewall settings to allow remote access.
 - Created a table called "students" to store the student information.

3. Building the Data Pipeline with Azure Data Factory:

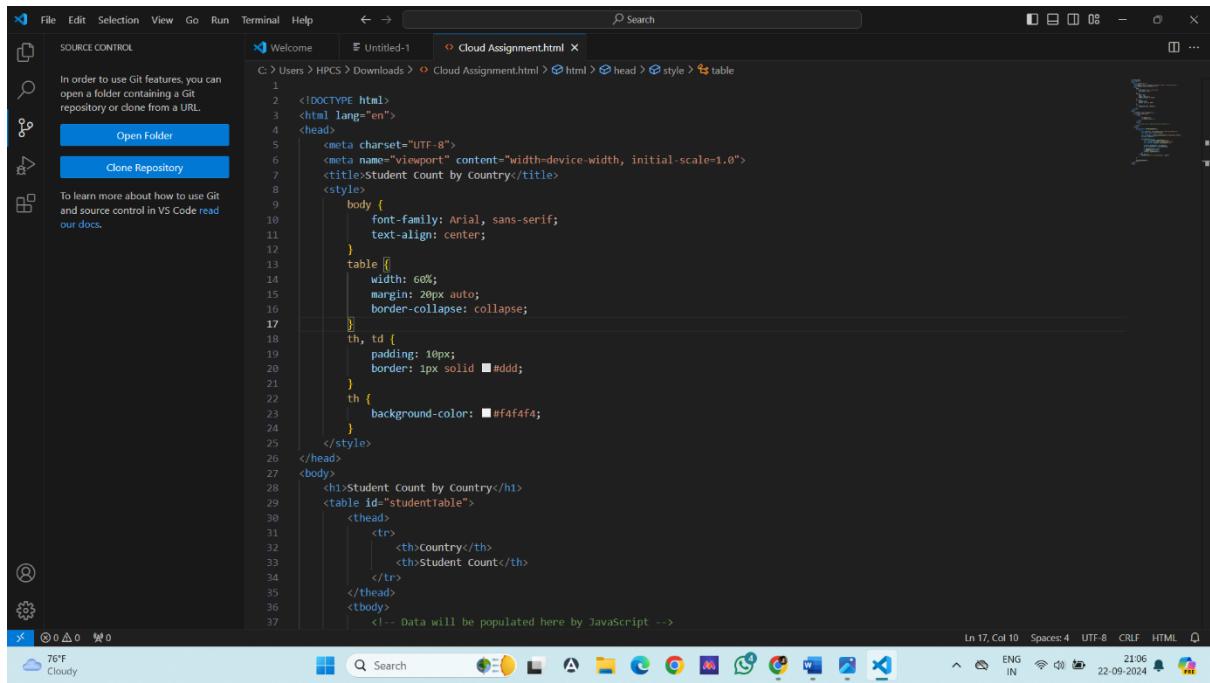
- Created an instance of Azure Data Factory.
- Set up linked services for both Azure Blob Storage and the Azure SQL Database.
- Created two datasets: one for the CSV file and another for the SQL table where the data would go.
- Built a pipeline that transfers data from the CSV file to the SQL Database and tested it to ensure everything worked smoothly.

4. Testing and Querying:

- Connected to the Azure SQL Database using Azure Data Studio and checked that the data was correctly inserted into the "students" table.

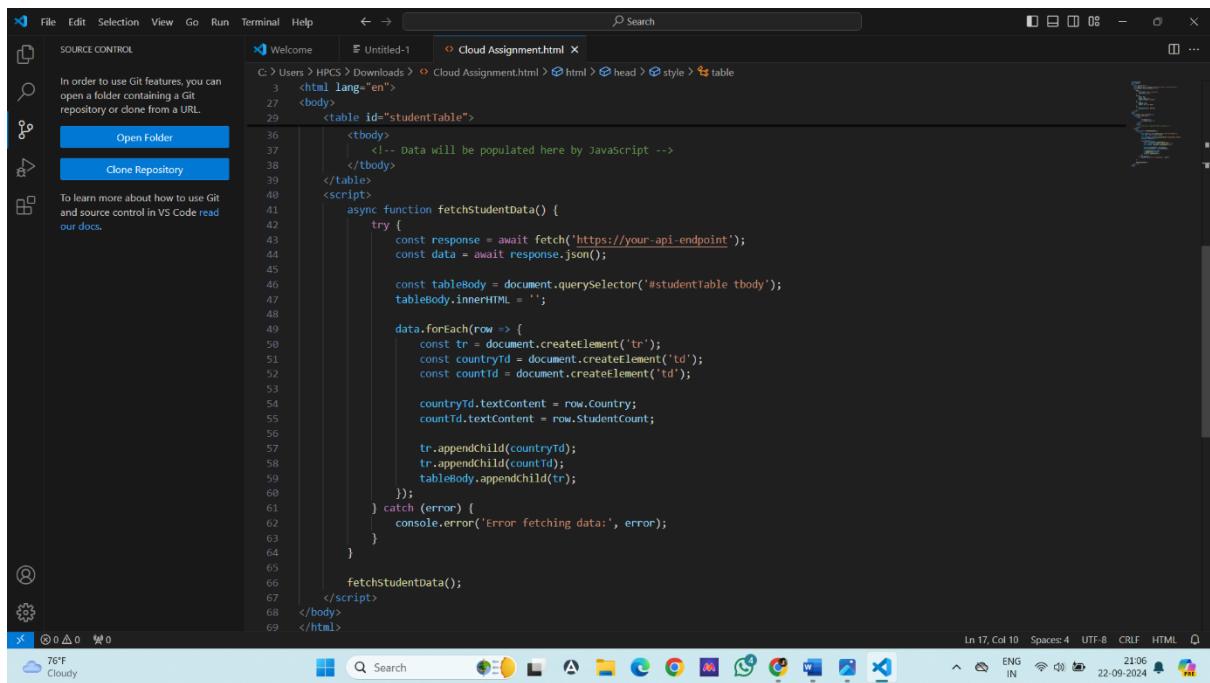
EXTRA CREDIT

Develop a Web Application:



```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Student count by country</title>
    <style>
        body {
            font-family: Arial, sans-serif;
            text-align: center;
        }
        table {
            width: 60%;
            margin: 20px auto;
            border-collapse: collapse;
        }
        th, td {
            padding: 10px;
            border: 1px solid #ddd;
        }
        th {
            background-color: #e4f4ff;
        }
    </style>
</head>
<body>
    <h1>Student count by country</h1>
    <table id="studentTable">
        <thead>
            <tr>
                <th>Country</th>
                <th>Student Count</th>
            </tr>
        </thead>
        <tbody>
            <!-- Data will be populated here by JavaScript -->
        </tbody>
    </table>
</body>

```



```
<html lang="en">
<body>
    <table id="studentTable">
        <tbody>
            <!-- Data will be populated here by JavaScript -->
        </tbody>
    </table>
    <script>
        async function fetchStudentData() {
            try {
                const response = await fetch('https://your-api-endpoint');
                const data = await response.json();

                const tableBody = document.querySelector('#studentTable tbody');
                tableBody.innerHTML = '';

                data.forEach(row => {
                    const tr = document.createElement('tr');
                    const countryId = document.createElement('td');
                    const countId = document.createElement('td');

                    countryId.textContent = row.Country;
                    countId.textContent = row.StudentCount;

                    tr.appendChild(countryId);
                    tr.appendChild(countId);
                    tableBody.appendChild(tr);
                });
            } catch (error) {
                console.error('Error fetching data:', error);
            }
        }

        fetchStudentData();
    </script>
</body>
</html>
```



| Country | Student Count |
|---------|---------------|
| India | 1200 |



Microsoft Web Static App Portal - be646653-b672 | Overview

Deployment is in progress

Deployment name : Microsoft.Web-StaticApp-Portal-be646653-b672
Subscription : Azure for Students
Resource group : Assignment-1

Start time : 9/22/2024, 3:54:06 PM
Correlation ID : dd88a488-1673-42d7-8185-80a4a37fd33

Deployment succeeded

Deployment 'Microsoft.Web-StaticApp-Portal-be646653-b672' to resource group 'Assignment-1' was successful.

Go to resource | Pin to dashboard

Microsoft Defender for Cloud

Free Microsoft tutorials

Work with an expert

Find an Azure expert >



The screenshot shows the Microsoft Azure Static Web Apps dashboard. At the top, there's a search bar and a Copilot button. Below the header, there are filter options: 'Subscription equals all', 'Resource group equals all', and 'Location equals all'. A table lists one record: 'mysorena' (Type: Static Web App, Resource group: Assignment-1, Location: Central US, Sku: Free, Subscription: Azure for Students). The table has columns for Name, Type, Resource group, Location, Sku, Subscription, and Default hostname. At the bottom, there are navigation buttons for < Previous, Page, Next >, and a feedback link.

Repository Link:

<https://github.com/niharikamg/mysorena>

Create an API to Fetch Data from Azure SQL Database:

The screenshot shows the Microsoft Azure Function code editor for 'HttpTrigger1'. The tab bar includes 'Code + Test', 'Integration', 'Function Keys', 'Invocations', 'Logs', and 'Metrics'. The 'Code + Test' tab is selected. The code editor displays the following JavaScript code for 'index.js':

```
1 const { ConnectionPool } = require('msql');
2
3 module.exports = async function (context, req) {
4     const config = {
5         user: process.env.SQL_USER,
6         password: process.env.SQL_PASSWORD,
7         server: process.env.SQL_SERVER,
8         database: process.env.SQL_DATABASE,
9         options: {
10             encrypt: true
11         }
12     };
13 }
```

Below the code editor is a 'Logs' panel which displays the message: 'Connected! You are now viewing logs of Function runs in the current Code + Test panel. To see all the logs for this Function, please go to 'Logs' from the Function menu.'

Student Count by Country

| Country | Student Count |
|---------------------|---------------|
| Bangladesh | 1 |
| Brazil | 9 |
| Canada | 7 |
| Chile | 1 |
| China | 13 |
| Colombia | 5 |
| Cuba | 1 |
| Dominican Republic | 1 |
| Egypt | 1 |
| El Salvador | 1 |
| Germany | 1 |
| India | 8 |
| Japan | 13 |
| Korea (Republic of) | 3 |
| Mexico | 24 |
| Morocco | 1 |
| Myanmar | 1 |
| Netherlands | 1 |
| Nicaragua | 1 |
| Pakistan | 3 |
| Peru | 1 |

WEBSITE Link: <https://mysorena.azurewebsites.net>

| Student Count by Country | |
|--------------------------|---------------|
| Country | Student Count |
| Bangladesh | 1 |
| Brazil | 9 |
| Canada | 7 |
| Chile | 1 |
| China | 13 |
| Colombia | 5 |
| Cuba | 1 |
| Dominican Republic | 1 |
| Egypt | 1 |
| El Salvador | 1 |
| Germany | 1 |
| India | 8 |
| Japan | 13 |
| Korea (Republic of) | 3 |
| Mexico | 24 |
| Morocco | 1 |
| Myanmar | 1 |
| Netherlands | 1 |
| Nicaragua | 1 |
| Pakistan | 3 |
| Peru | 1 |

Objective:

The goal of this project is to develop a static web application, hosted on Azure, that retrieves and displays student count data by country. The student data is stored in an Azure SQL Database, and the web app connects to an API that queries the database to present the results.

Tools Used:

1. Azure SQL Database: Stores the student data, including student IDs, names, and countries.
2. Azure Data Factory: Builds a pipeline for processing and transferring data to the SQL Database.
3. Azure Storage: Hosts the CSV file with student data, which is processed and transferred to the database.
4. Azure Static Web App: Hosts the front-end application that shows the student count by country.
5. Azure Functions: Provides the API backend to retrieve the student count data from the SQL Database.

